

## CASE STUDY - Coating/Immersing

### TASK TITLE: Coating/Immersing

<b>Task Description:</b>	<p>Coating/Immersing involves dipping parts into dip tanks to apply a coating. Part weight and size can vary considerably. The task is typically performed in a standing position. Since the liquid in the dip tanks may be caustic, hangar/fixtures are used to immerse the parts. Small parts may be secured to hangars using small clips. Large parts may simply be hung on a hook.</p> <p>Coating/immersing is performed in (not necessarily limited to):</p> <ul style="list-style-type: none"><li>• general maintenance areas.</li></ul> <p>In this case study, the assumed situation is that the operator is required to hold the hangar and move the parts in and out of the dip tanks. In Air Force applications, this job is expected to be low volume.</p>
<b>Job Performance Measures Most Often Impacted by Coating/Immersing:</b>	<ul style="list-style-type: none"><li>• Quality of surface finish.</li><li>• Quality of work.</li></ul>
<b>Typical Employee Comments about Coating/Immersing:</b>	<p>The most common complaint from employees is discomfort and/or stiffness in the hands/wrists/arms and shoulders/neck.</p>
<b>Suggested Level II Analysis:</b>	<p>Grip Force Measurement, Postural Analysis, Biomechanical Lifting Analysis</p>

## Shoulders/Neck

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
1. Reaching	<ul style="list-style-type: none"> <li>Loading height is too high</li> <li>Sides of dip tanks are too high</li> </ul>	123. Raise the person <ul style="list-style-type: none"> <li>provide a fixed platform to elevate worker for all dip tanks</li> </ul>		✓	high	med	high
		32. Lower the work surface <ul style="list-style-type: none"> <li>lower the height of the dip tanks (should be no higher than 30" (76cm) above the floor.</li> </ul>		✓	high	med	high
	<ul style="list-style-type: none"> <li>Raising and lowering of hangers</li> </ul>	61. Provide a mechanical lift device <ul style="list-style-type: none"> <li>provide an overhead manual pulley system above tanks to raise and lower hangars</li> </ul>		✓	med	med	med
	<ul style="list-style-type: none"> <li>Absence of tow space</li> </ul>	80. Provide adequate leg clearance <ul style="list-style-type: none"> <li>provide toe space of 6" X 6" (15 cm X 15 cm)</li> </ul>		✓	high	med	high
2. Arm forces: Repeated contraction of the muscles of the arm or holding/carrying materials	<ul style="list-style-type: none"> <li>Repeated manual dipping of large parts</li> </ul>	61. Provide a mechanical lift device for dipping large components <ul style="list-style-type: none"> <li>provide an overhead hoist with a basket attachment for dipping parts</li> </ul>		✓	high	med	med
		<ul style="list-style-type: none"> <li>provide an overhead manual pulley system.</li> </ul>		✓	med	med	med

### Shoulders/Neck (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
3. High speed, sudden shoulder movements	<ul style="list-style-type: none"> <li>Rarely occurs</li> </ul>	N/A					
4. Head/neck bent or twisted	<ul style="list-style-type: none"> <li>Rarely occurs</li> </ul>	N/A					

## Hands/Wrist/Arm

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
5. Bent wrists/repeated wrist movements or repeated forearm rotation	<ul style="list-style-type: none"> <li>Design of the dipping tool causes wrist movements while dipping parts</li> <li>Design clamps on hanger may require wrist movements to tighten</li> </ul>	77. Provide a tool with an appropriate handle angle		✓	med	med	med
		<ul style="list-style-type: none"> <li>provide a dipping tool which allows the person to keep the wrist straight while dipping</li> </ul>					
6. Repeated manipulations with fingers	<ul style="list-style-type: none"> <li>Tasks are hand-intensive</li> </ul>	140. Use alternative fasteners		✓	high	med	high
		<ul style="list-style-type: none"> <li>use lockable clamps; avoid the use of pressure or screw-down clamps</li> </ul>					
6. Repeated manipulations with fingers	<ul style="list-style-type: none"> <li>Tasks are hand-intensive</li> </ul>	20. Incorporate rest pauses	✓		low	med	med
		25. Increase task variety <ul style="list-style-type: none"> <li>alternate dipping big parts with small parts</li> </ul>	✓		low	med	med
7. Hyperextension of finger/thumb or repeated single finger activation	<ul style="list-style-type: none"> <li>Rarely occurs</li> </ul>	N/A					

### Hands/Wrist/Arm (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
8. Hand/grip forces	• Person is holding hanger or part	118. Provide support for the work piece • provide an overhead stationary hook to hanger part above tank as it drains	✓	✓	med	med	med
	• Inappropriate design of clamps for small parts	140. Use alternative fasteners		✓	high	med	high
9. High speed hand/wrist/arm movements or vibration, impact, or torque to the hand	• Rarely occurs	N/A					
10. Exposure to hard edges	• Rarely occurs	N/A					
11. Hands and fingers exposed to cold temperatures	• Work area is cold	93. Provide appropriate gloves (must be safe for use in area with liquid/caustic materials)		✓	med	med	med


## **Back/Torso**

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
12. Repeated forward or sideways bending movements	<ul style="list-style-type: none"> <li>Loading height is too high</li> <li>Sides of dip tanks are too high</li> </ul>	123. Raise the person <ul style="list-style-type: none"> <li>provide a fixed platform to elevate worker for all dip tanks</li> </ul>		✓	high	med	high
		32. Lower the work surface <ul style="list-style-type: none"> <li>lower the height of the dip tanks (should be no higher than 30" (76 cm) above the floor).</li> </ul>		✓	high	med	high
13. Twisting of the lower back	<ul style="list-style-type: none"> <li>Raising and lowering of hangers</li> <li>Absence of toe space</li> </ul>	61. Provide a mechanical lift device <ul style="list-style-type: none"> <li>provide an overhead manual pulley system above tanks to raise and lower hangers</li> </ul>		✓	med	med	med
		80. Provide adequate leg clearance <ul style="list-style-type: none"> <li>provide toe space of 6" x 6" (15 cm x 15 cm)</li> </ul>		✓	high	med	high
14. High speed, sudden movements	<ul style="list-style-type: none"> <li>Rarely occurs</li> </ul>	N/A					
15. Static, awkward back postures	<ul style="list-style-type: none"> <li>Manual holding of parts/hanger above dip tank while fluid drains</li> </ul>	118. Provide support for the work piece. <ul style="list-style-type: none"> <li>provide an overhead stationary hook to hang part above dip tank.</li> </ul>	✓	✓	med	med	med

### Back/Torso (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
16. Lifting forces	<ul style="list-style-type: none"> <li>Repeated manual dipping of large parts</li> </ul>	61. Provide a mechanical lift device <ul style="list-style-type: none"> <li>provide an overhead hoist with a basket attachment for dipping parts</li> <li>provide an overhead manual-pulley-system to raise and lower hangars</li> </ul>		✓	med	med	med
				✓	med	med	med
17. Pushing or pulling	<ul style="list-style-type: none"> <li>Rarely occurs</li> </ul>	N/A					
18. Whole body vibration	<ul style="list-style-type: none"> <li>Rarely occurs</li> </ul>	N/A					

## Legs/Feet

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
19. Fixed position, standing	<ul style="list-style-type: none"> <li>Standing surface is hard</li> </ul>	96. Provide appropriate shoe inserts	✓		low	low	low
		143. Wear appropriate shoes	✓		low	low	low
20. Exposure to hard edges on legs, knees, and feet	<ul style="list-style-type: none"> <li>Knees press against front of dip tank (see Figure 1.1)</li> </ul>  <p><b>Figure 1.1</b></p>	9. Eliminate exposure to hard edges <ul style="list-style-type: none"> <li>cover surface with rubber</li> </ul>	✓		low	low	low
21. Awkward leg postures	<ul style="list-style-type: none"> <li>Rarely occurs</li> </ul>	N/A					
22. Standing foot pedal	<ul style="list-style-type: none"> <li>Rarely occurs</li> </ul>	N/A					



## Head/Eyes

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
23. Difficult to see/light levels too low/too high	<ul style="list-style-type: none"> <li>Glare directly from a light source: looking towards an overhead light</li> <li>Glare from an overhead light reflected off equipment or worksurface.</li> </ul>	109. Provide protection from glare from overhead lights/task lights	✓		low	med	med
		<ul style="list-style-type: none"> <li>position work between overhead lights.</li> </ul>	✓		low	med	med
		<ul style="list-style-type: none"> <li>remove glossy or shiny surfaces from work area</li> </ul>	✓	✓	med	med	med
		<ul style="list-style-type: none"> <li>place the work station so that it faces a wall or partition.</li> </ul>		✓	high	med	med
	<ul style="list-style-type: none"> <li>Glare directly from a light source: looking towards an uncovered window</li> <li>Glare from an uncovered window reflected off equipment or worksurface.</li> </ul>	108. Provide protection from glare from natural light	✓		low	med	med
		<ul style="list-style-type: none"> <li>orient work station so that the person faces perpendicular to the window.</li> </ul>	✓		low	med	med
		<ul style="list-style-type: none"> <li>adjust window coverings</li> </ul>		✓	low med to high	med med	med med
		<ul style="list-style-type: none"> <li>provide window coverings</li> </ul>					
	<ul style="list-style-type: none"> <li>Glare directly from a light source: looking towards a task light</li> <li>Glare from a task light reflected off equipment or worksurface.</li> </ul>	109. Provide protection from glare from overhead lights/task lights	✓		low	med	med
		<ul style="list-style-type: none"> <li>adjust the task light to reduce glare.</li> </ul>	✓		low	med	med
		<ul style="list-style-type: none"> <li>turn off the task light.</li> </ul>		✓	low low to med	med med	med med
		<ul style="list-style-type: none"> <li>shield task light to prevent it from shining into eyes.</li> </ul>					

### Head/Eyes (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	<ul style="list-style-type: none"> <li>Light levels too high.</li> </ul>	27. Lower the light levels <ul style="list-style-type: none"> <li>remove pairs of fluorescent light bulbs from overhead fixtures.</li> </ul> Note: this should be done with the appropriate technical assistance and the agreement of co-workers in the area.		✓	low to med	med	med
	<ul style="list-style-type: none"> <li>Light levels too low.</li> </ul>	22. Increase light levels <ul style="list-style-type: none"> <li>provide task light</li> <li>increase overall light levels to meet the needs of tasks</li> </ul>		✓ ✓	med med	med med	med med
	<ul style="list-style-type: none"> <li>Uncorrected visual disorders cause the person to lean forward to see work</li> </ul>	14. Encourage person to have visual disorders corrected	✓		low	med	med
	<ul style="list-style-type: none"> <li>Text too small to read.</li> <li>Text is difficult to read (poor quality)</li> </ul>	18. Improve visual access to work <ul style="list-style-type: none"> <li>increase size of text</li> <li>increase the legibility of text</li> </ul>	✓ ✓	✓ ✓	med med	med med	med med
24. Intensive visual tasks, staring at work objects for long periods	<ul style="list-style-type: none"> <li>Length of work task without a change of position for the eyes.</li> </ul>	8. Distribute intensive activities throughout the process <ul style="list-style-type: none"> <li>perform intensive visual tasks for short periods throughout the day (as opposed to in one continuous session).</li> </ul>	✓		low	med	med

### Head/Eyes (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
		20. Incorporate rest pauses • periodically look away from screen.	✓		low	med	med

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